REMARKS/ARGUMENTS

Responsive to the Final Office Action dated December 30, 2005, Applicant has amended 1, 12, 23, 24, 40, 42, 53 and 55. Claims 2, 3, 25, 27, 41, 43, and 56 have been canceled. Accordingly, Claims 1, 4-24, 26, 28-40, 42, and 44-55 are now pending for prosecution with Claims 1, 13, 24, 31, 40, 42, 53, 54, and 55 being independent.

I. The § 102(a) Rejection

Claims 42, 47 and 55, were rejected under 35 USC 102(a) as being anticipated by U.S. Publication No. 2003/0122285 A1 to Crane et al.. Claim 42 has been amended to incorporate the limitations of Claim 43, Claim 47 depends from Claim 42, and Claim 55 has been amended to incorporate the limitations of Claim 56, thereby rendering this rejection moot. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

II. The § 103 Rejection over Crane in view of Seemann

Claims 1-2, 4-24 26-40, 43-46, 48-52, 54 and 56 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Crane et al. in view of U.S. Patent No. 5,702,663 to Seemann. For the following reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claim combination and the reasonable

expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicant respectfully submits that a prima facie case of obviousness has not been established because both Crane and Seemann, individually and in combination, fail to teach or suggest the claimed invention. Applicant's invention is directed to a flexible mold body structure that corresponds or conforms in shape to the fiber-reinforced composite part desired to be made wherein the flexible body structure is formed by spraying polyurethane on a pattern and has an interfacing surface and a perimeter region including a perimeter seal configured for sealing engagement with the base mold. Resin and vacuum distribution channels are formed in the interfacing surface to deliver resin across and through the lay up, respectively, to properly mix the resin/fiber combination which forms the desired fiber-reinforced composite part. Application of a first vacuum causes the perimeter seal of the flexible body structure to sealingly engage with the base mold to enclose materials between the body structure and the mold. Application of a second vacuum causes the interfacing surface to draw against the resin/fiber combination and the mold to shape the combination into the desired part.

As discussed in the teleconference between the undersigned, Applicant, and the Examiner, Crane and Seemann fail to teach a soft mold tool with the following features: (1) a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the soft tool (*see Claims 1, 31, 42, and 53*); (2) a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern (*see Claims 13, 24, 40, 42, 53, 54, and 55*); or (3) a flexible unitary body structure that conforms or corresponds to the shape of the composite part to be made (*see Claims 24, 40, 42, 53, and 55*).

Turning to feature (1), Applicant's molding tool provides one or more vacuum output ports in fluid communication with the vacuum distribution channels on the interfacing surface of the flexible body structure and the perimeter seal vacuum distribution channels thereby providing a first vacuum across said interfacing surface and an independent second vacuum along the perimeter seals. As discussed at paragraph [0031] of Applicant's specification, "because the vacuum draw for the perimeter seals is independent of the vacuum draw by the vacuum output port 16 directing the flow of the resin, it can be set at higher vacuum levels than the resin vacuum port 16." Thus, Applicant's invention allows for at least two separate vacuum that enable different vacuum levels to be used in the perimeter seal and the interior portions.

It is asserted in the Office Action that Crane teaches "drawing a vacuum to seal said flexible member against said mold tool (base)(first vacuum) and also to evacuate gas/air from the space between the flexible member and said mold tool (base)(second vacuum). Applicant respectfully traverses this assertion. Crane does not generate two independent vacuums for sealing the perimeter and for drawing resin across the interfacing surface as claimed by Applicant. Rather, Crane only applies a single vacuum to the entire system that, in the act of drawing resin through the fiberglass fill to the edge of the mold, also pulls entrapped air. Without the vacuum distribution channels extending across the sheet's interfacing surface, Crane cannot generate a first vacuum for the perimeter seal and a separate vacuum for the interior portions of the soft tool thereby allowing for different vacuum levels in the perimeter seal and the interior portions. Crane's single vacuum level can only be applied to the entire system. Thus, Crane does not have the capability to affect that portion of the B mold that is actually in contact with the fiber load without affecting the perimeter seal.

Similarly, Seemann also fails to teach or suggest a molding tool that provides one or more vacuum output ports in fluid communication with the vacuum distribution channels on the interfacing surface of the flexible body structure and the perimeter seal vacuum distribution channels thereby providing a first vacuum across said interfacing surface and an independent second vacuum along the perimeter seals. Rather, Seemann teaches a conventional vacuum bag for forming of a fiber-reinforced composite article having optional vacuum conduits molded into the periphery of the vacuum bag and a resin distribution conduit sealed into the vacuum bag. This type of closed molding technique is discussed at paragraph 0005 of Applicant's specification. Like Crane, Seemann also cannot generate a vacuum for the perimeter seal or seals and a separate vacuum for the interior portions of the soft tool thereby allowing for different vacuum levels in the perimeter seal and the interior portions. Seemann's single vacuum level can only be applied to the entire system. Thus, like Crane, Seemann does not have the capability to affect that portion of the B mold that is actually in contact with the fiber load without affecting the perimeter seal. Accordingly, neither Crane nor Seemann teach or suggest all of the elements of independent Claims 1, 31, 42, and 53 and the claims depending therefrom.

Turning now to features (2) and (3), Applicant's molding tool provides a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern that conforms or corresponds to the shape of the composite part to be made. First, spray-forming allows the flexible body structure to more closely approximate the shape of the base or "A" mold. There is no teaching or suggestion by Crane to spray-form Crane's "soft tool" nor is there any teaching or suggestion to use polyurea, polyurethane, or polyurea/polyurethane to form the soft tool. Rather, Crane's "soft tool" sheet is pre-formed from a silicone rubber and then placed over the base mold. It is well known that,

when used in flexible molds, silicones are difficult, if not impossible, to reform or reuse. As stated in the Office Action, "although Crane . . . teach that said mold member is made from a resilient, durable material, such as silicone rubber, Crane . . . do[es] not teach a polyurethane material (aromatic, aliphatic, polyaspartic)."

Similarly, there is no teaching or suggestion by Seemann to spray-form Seemann's "vacuum bag" nor is there any teaching or suggestion to spray-form a polyurethane material to form the vacuum bag disclosed in Seemann. Rather, Seemann's vacuum bag is formed by repeated applications of an elastomer with good brushability such as silicone rubber. The Office Action asserts that "spraying a polyurethane material is well known" and further that "Seemann . . . teaches that silicone rubber and polyurethane rubber (aromatic, aliphatic, polyaspartic) are alternative materials in constructing a flexible, mold member." Thus, it is concluded that "it would have been obvious for one of ordinary skill in the art to have used a polyurethane rubber as taught by Seemann ('663) to build the mold member in the process and apparatus of Crane . . . because Seemann ('663) specifically teaches that silicone rubber and polyurethane rubber are alternative materials in constructing a flexible, mold member . . . whereas Crane . . . suggests using other materials besides silicone rubber as long as said materials are a resilient, durable material." Applicant respectfully traverses these assertions.

First, the Examiner has provided no support for the statement that "spraying a polyurethane material is well known." While this may be true in coatings, films and varnishes, it is not true of the relevant industry of molds for producing fiber-reinforced vehicle or boat parts. Crane and Seemann both support that the use of preforms are the common practice in closed molding techniques, but utterly fail to disclose any spray-forming thereby negating the assertion that spray-forming polyurethane to create a soft tool mold is well known in the art.

Second, while it is true that Seemann makes a single reference to use of a polyurethane rubber at Column 8, lines 7-15, this use is described in the context of forming Seemann's "vacuum bag" which is made from a pre-formed sheet that is laid across the mask and then formed by vacuum or external pressure into the shape of the desired B tool. The sheet is then cured by the application of temperature cycling or exposure to a curing agent. As stated at Column 8, lines 11-14, "[a]ll such materials are settable: they may be deformed into a shape and then set in that shape to form the bag 4 of the invention." This is a common practice with silicones, but Applicant respectfully submits that such a procedure does not work with polyurethane. Polyurethane is produced by the condensation reaction of a polyisocyanate and a hydroxyl-containing material. Polyurethane exists as a liquid or a cured sheet of material but there is no in-between state. It is well known in the art that polyurethane cannot be formed into an uncured sheet that is later cured by either heat-cycling or introduction of a curing agent because the cross-bonds formed between the adjacent molecules prevent the polymer from melting. Rather, if excessive heat is applied, the polymer will degrade rather than melt. Applicant therefore respectfully submits that those skilled in the art would know that it is not possible to create a sheet of uncured polyurethane that is then heated and deformed into a shape and then set in that shape to form Seemann's vacuum bag without losing all of the desirable physical properties of polyurethane. Further, anyone attempting to construct a polyurethane vacuum bag in accordance with the teachings of Seemann would not succeed. Thus, neither Crane nor Seemann teach or suggest all of the elements of independent Claims 13, 24, 40, 42, 53, 54, and 55 and the claims depending therefrom.

Prima facie obviousness requires that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in

the art, to modify the reference or combine reference teachings. No such suggestion or motivation exists in Crane or Seemann, alone or in combination, to provide: (1) a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the flexible tool; (2) a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern; or (3) a flexible unitary body structure that conforms or corresponds to the shape of the composite part to be made. Moreover, there is no expectation of success when Crane and Seemann are combined in that their combination would not result in a working mold tool similar to that of Applicant. Finally, the prior art references, when combined, must teach or suggest all the claim limitations. As discussed above, neither of the cited references, alone or in combination, teach or suggest all of the elements of Applicant's independent Claims 1, 13, 24, 31, 40, 42, 53, 54, and 55. Unless all the elements are taught by the references, there can be no success in modifying them.

Thus, at the time the present invention was made, neither of the cited references teach or describe *all* of the limitations claimed by Applicant in independent Claims 1, 13, 24, 31, 40, 42, 53, 54, and 55. It would therefore not have been obvious to one of ordinary skill in the art to provide a flexible body structure having a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the soft tool, or a flexible body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern or a flexible unitary polurethane body structure that conforms or corresponds to the shape of the composite part to be made, and it certainly would not have been obvious to one of ordinary skill to provide the combination thereof. Accordingly, Claims 1, 13, 24, 31, 40, 42, 53, 54, and 55 and the claims depending therefrom are nonobvious under § 103(a).

III. The § 103 Rejection over Crane in view of Hooper

Claim 53 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Crane in view of U.S. Patent No. 5,576,030 to Hooper. For the following reasons, Applicant respectfully requests reconsideration and withdrawal of this rejection.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claim combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

As discussed above, Crane fails to teach a soft mold tool with the following features: (1) a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the soft tool; (2) a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern; or (3) a flexible unitary body structure that conforms or corresponds to the shape of the composite part to be made. All three of these features appear in Claim 53.

It is asserted in the Office Action that "[a]lthough Crane . . . teach drawing a vacuum to seal said flexible member against said mold tool (base)(first vacuum) and also to evacuate gas/air from the space between said flexible member and said mold tool (base)(second vacuum), Crane . . . do[es] not teach a first a second vacuum port. Hooper ('030) teaches a molding system including first vacuum ports (16) for sealing and a second vacuum port (44) for forming a

vacuum envelope. . . . Therefore, it would have been obvious to one of ordinary skill in the art to have provided a second vacuum port as taught by Hooper ('030) in the mold system of Crane . . . because of known advantages that a plurality of vacuum ports provides such as reduced processing time, increase[d] vacuum levels that result in reduced porosity and improved characteristics of the resulting molded product." Applicant respectfully traverses this assertion. As discussed above in connection with the previous § 103(a) rejection over Crane, Crane does not generate two independent vacuums for sealing the perimeter and for drawing resin across the interfacing surface as claimed by Applicant. Rather, Crane only applies a single vacuum to the entire system that, in the act of drawing resin through the fiberglass fill to the edge of the mold, also pulls entrapped air. Without the vacuum distribution channels extending across the sheet's interfacing surface, Crane cannot generate a first vacuum for the perimeter seal and a separate vacuum for the interior portions of the soft tool thereby allowing for different vacuum levels in the perimeter seal and the interior portions. Crane's single vacuum level can only be applied to the entire system. Thus, Crane does not have the capability to affect that portion of the B mold that is actually in contact with the fiber load without affecting the perimeter seal.

Similarly, Hooper also fails to teach or suggest a molding tool that provides one or more vacuum output ports in fluid communication with the vacuum distribution channels on the interfacing surface of the flexible body structure and the perimeter seal vacuum distribution channels thereby providing a first vacuum across said interfacing surface and an independent second vacuum along the perimeter seals. Rather, Hooper merely teaches a conventional vacuum bag for forming of a fiber-reinforced composite article having optional vacuum conduits molded into the periphery of the vacuum bag and a resin distribution conduit sealed into the vacuum bag. Like Crane, the Hooper vacuum conduits are located at the periphery of the

vacuum bag rather than being formed upon and extending across the interfacing surface. Hooper also cannot generate a vacuum for the perimeter seal or seals and a separate vacuum for the interior portions of the soft tool thereby allowing for different vacuum levels in the perimeter seal and the interior portions. Hooper's single vacuum level can only be applied to the entire system. Thus, like Crane, Hooper does not have the capability to affect that portion of the B mold that is actually in contact with the fiber load without affecting the perimeter seal. Accordingly, neither Crane nor Hooper teach or suggest all of the elements of independent Claim 53 and the claims depending therefrom.

Turning now to features (2) and (3), Applicant's molding tool provides a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern that conforms or corresponds to the shape of the composite part to be made. First, spray-forming allows the flexible body structure to more closely approximate the shape of the base or "A" mold which certainlycould include complex angles therein. There is no teaching or suggestion by Crane to spray-form Crane's "soft tool" nor is there any teaching or suggestion to use polyurea, polyurethane, or polyurea/polyurethane to form the soft tool. Rather, Crane's "soft tool" sheet is pre-formed from a silicone rubber and then placed over the base mold. As stated in the Office Action, "although Crane . . . teach that said mold member is made from a resilient, durable material, such as silicone rubber, Crane . . . do[es] not teach a polyurethane material (aromatic, aliphatic, polyaspartic)." Similarly, there is no teaching or suggestion by Hooper to spray-form Hooper's vacuum bag nor is there any teaching or suggestion to spray-form a polyurethane material to form the vacuum bag disclosed in Hooper.

Prima facie obviousness requires that there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. No such suggestion or motivation exists in Crane or Hooper, alone or in combination, to provide: (1) a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the soft tool; (2) a flexible unitary body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern; or (3) a flexible unitary body structure that conforms or corresponds to the shape of the composite part to be made. Moreover, there is no expectation of success when Crane and Hooper are combined in that their combination would not result in a working mold tool similar to that of Applicant. Finally, the prior art references, when combined, must teach or suggest all the claim limitations. As discussed above, neither of the cited references, alone or in combination, teach or suggest all of the elements of Applicant's independent Claim 53. Unless all the elements are taught by the references, there can be no success in modifying them.

Thus, at the time the present invention was made, neither of the cited references teach or describe *all* of the limitations claimed by Applicant in independent Claim 53. It would therefore not have been obvious to one of ordinary skill in the art to provide a flexible body structure having a first vacuum for the perimeter seal and a separate second vacuum for the interior portions of the soft tool, a flexible body structure formed by spraying a material selected from the group consisting of polyurea, polyurethane, and polyurea/polyurethane on a pattern or a flexible unitary body structure that conforms or corresponds to the shape of the composite part to be made. Accordingly, Claim 53 is nonobvious under § 103(a).

IV. Conclusion

Applicant respectfully submits the claims are in condition for formal allowance which is courteously solicited. If any issue regarding the allowability of any of the pending claims in the present application could be readily resolved, or if other action could be taken to further advance this application such as an Examiner's amendment, or if the Examiner should have any questions regarding the present amendment, it is respectfully requested that the Examiner please telephone Applicant's undersigned attorney in this regard. The Examiner's attention is also drawn to the proper correspondence address shown below. Should any fees be necessitated by this response, the Commissioner is hereby authorized to deduct such fees from Deposit Account No. 11-0160.

Respectfully submitted,

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